IMPROVED COMPUTING SYSTEM AND COMPUTING DEVICE

The present invention relates to an improved computing system and an improved computing device, and particularly, but not exclusively, relates to improvements in small computing devices and computing systems employing small computing devices.

It is generally desirable that computers are made smaller so that they become portable. "Desktop"-type computers are not portable. "Laptop" type computers are portable, but they are still relatively bulky and inconvenient. Further, the user interface peripherals provided with laptops eg. keyboard, mouse, display, are usually not of an ideal size. The "full size" user interface peripherals provided with desktop-type computers are far more optimal.

Smaller computing devices, such as "palm top" type computers are now becoming popular. These are less bulky and more conveniently portable than laptop types (they can even be carried in a user's pocket). The user interface provided with such devices is, however, even more limited than with laptop types. It is difficult to manipulate the relatively small keyboards which are provided with palmtop types and the displays which are provided are limited. Other types of small computing devices utilise alternative interfaces such as touch screens, but these may be even more difficult to manipulate.

The interfaces of the very small computing devices may be so limited that they may not be able to support the same applications that can be supported on larger computing devices such as desktop type computers. That is, new applications may need to be written for these devices which, for example, provide different types of displays, and different functionality.

Even smaller computing devices are known which have more limited user interfaces, such as limited keyboards (i.e. not having all the available keys of a QWERTY

keyboard). These are even less desirable and input/output is very difficult. An example of such a limited computing device is a mobile phone. A mobile phone includes a very limited array of input keys (usually just numeric plus a few more operating keys). If alphabetical information needs to be input (e.g., inputting a name to the mobile phone memory) a single key must usually provide for multiple alpha characters. Further, the displays on mobile phones are very small and cannot present a great deal of information.

There is therefore a dilemma, between the requirement for smaller computing devices i.e. more portable computing devices, and the need to be able to conveniently operate and access the devices, and obtain computed information from the devices, via appropriate and convenient user interfaces.

It is known to provide desktop type computers such as PCs with proprietary software which enables them to manipulate data in mobile telephones. This requires proprietary software written for manipulation of data in a particular "make" of mobile phone, and the software must be resident on the PC. In such systems, the PC resident software usually up-loads data from the mobile phone. The mobile phone data is then manipulated by the PC software on the PC processor and the result of manipulation is then down-loaded to the mobile phone i.e., the mobile phone data is updated. There is no real interaction between the mobile phone processor and the PC processor, other than the updating of the data. Only data is exchanged between the mobile telephone and the desk top computer. There is no exchange of instructions. Further, the arrangement is not generic. For each different manufacture of mobile phone, a different application must be provided for the desk top PC.

Similar arrangements exist for synchronisation of applications on desktop and some palmtop type computers. That is, an application resident on a palmtop type computer

may be reproduced as an application written for the desktop type computer. Data may be exchanged between the palmtop type computer and the desktop type computer via an appropriate link, in a similar manner to the mobile phone/desktop systems. The user can then manipulate the data employing the desktop software. Alternatively, the same data can be manipulated employing the palmtop software. The data can be synchronised by up-loading/down-loading between the palmtop computer and the desktop computer with an appropriate link. When the desktop software is being employed to manipulate the data it is the processor of the desktop computer which is being used. Similarly when the palmtop computer is manipulating the data, it is the processor of the palmtop which is being employed.

Software is also known which enables a client computer to manipulate a server computer over a network. This software is limited to the control of desktop type computers, however.

It is also known to drive different displays using the same application. For example, the application EXCEL™ may run on one display with a predetermined number of columns, and it is known to run it on an expanded display with the same predetermined number of columns, but the columns are wider on the expanded display.

The present invention provides a small computing device comprising a processing means, a small user interface and an operating means enabling the processing means to receive commands from and/or control outputs of the small user interface, the operating means also being arranged to enable the processing means to receive commands from and/or control output of an external large user interface, the operating means being arranged to adapt to the commands received or adapt the output produced depending upon whether the large user interface or small user interface is being accessed, so that different

information may be output from or different commands received for control of the same application running on the processing means of the small computing device.

By "small computing device" we mean laptop type computer and smaller, such as palmtop type, mobile phone and other computing devices which generally have limited user interfaces ("small user interface") but are convenient to transport. Preferably, "small computing device" means palmtop type and smaller.

By "large user interface" we mean generally any user interface which is less limited than the "small user interface" of the small computing device. Preferably, however, by "large user interface" we mean the standard type of user interface usually associated with a desktop type computer, ie. the standard size key board which may be a QWERTY keyboard but is not limited thereto), a standard size display such as a CRT, and, optionally, a graphical user interface input device, such as a mouse.

The small computing device of the present invention can therefore operate in two modes. In the first mode, commands are received and outputs are provided to the small, limited user interface, usually integrated with the small computing device. In a second mode of operation, all the facilities of a large user interface can be employed and inputs can be received from the large user interface and outputs provided to the large user interface. The application is still running on the small computing device, but access is available from the more convenient large user interface.

The operating means may be an operating system which is arranged to control operation of the small computing device in the two modes, i.e., in the first mode accessing the small user interface and in the second mode accessing the external large user interface. Applications are specially written for the small computing device to facilitate the operation in two modes. The operating means

may not be an operating system in the conventional manner (e.g., DOS™, WINDOWS™, etc), but may just be a set of common rules for the operation of application programs associated with the small computer interface. That is the applications will be written to conform with the common rules so they are able to operate in both modes of operation.

The limits on the smallness of the size of computing devices are not governed, generally, by the amount of computing power required, particularly when it comes to the computing power required by the conventional PC user. Rather, the size is limited by the amount of the user interface which is desirable, as discussed above. This invention preferably enables the owner of the small computing device to have all the advantages of a large user interface. It is also envisaged that smaller computing devices, such as mobile phones which have very limited user interfaces, with this invention will be used more and more as the "main" computing device for a particular user. The disadvantage of the smaller user interface is no longer significant, as the large user interface will be available via the present invention.

Preferably, the small computing device includes a communication means which enables it to receive commands from and provide outputs to the large user interface.

One of the major features of the invention is that the operating means is adapted to respond to different command inputs and provide different outputs For example, an output to a display from the device of the present invention doesn't merely provide an expanded display when the large user interface is being accessed, as with the prior art, but may actually provide a different display eg. different information may be displayed. In the example given in the preamble in relation to the prior art, a five column display of EXCEL™ merely appears, on a larger

display device, as an expanded display of five columns that are wider than the same five columns which are displayed on a more limited display. With the present invention, in a first mode of operation on the limited display perhaps only one or two EXCEL™ columns would be produced. On the large display of the large user interface, however, a totally different display will be produced in accordance with the second mode of operation of the operating system. This might be five EXCEL™ columns, for example. Similarly, the operating means may be arranged to receive different input commands from the large user interface and the small user interface, depending on which is being accessed. One particular application, eg. a word processing application, running on the processing means of the small computing device, could therefore be operated differently and produced different outputs depending on whether the large user interface is being accessed or the small user interface is being accessed.

To achieve this functionality, applications having two modes of operation as far as the interfaces are concerned would have to be written for the small computing device according to the present invention.

Preferably, the large user interface may be provided by a "large computing device". By "large computing device" we mean laptop type or larger, such as desktop type, server, mainframe, etc. Preferably, "large computing device" means desktop type, and larger. Note that desktop type computers include commonly known computers such as PC's, Apple Macintosh, etc. The large user interface associated with these large computing devices is preferably accessible by the small computing device of the present invention. The advantage of being able to use the large user interface of already-installed computing devices, such as PC's, is that they are ubiquitous.

To enable access to the large user interface of a

large computing device, a slave operating system means is preferably provided on the large computing device. The slave operating means is controlled by the operating means of the small computing device (the "master" operating means) to enable the operating means of the small computing device to essentially "enslave" the large user interface of the large computing device. Preferably, the slave operating means resident on the large computing device does not affect any other software application resident on the large computing device. The small computing device can therefore take over the operation of the interface of any large computing device which has the slave operating means software, without affecting any applications on the large computing device.

Preferably, the slave operating means software may be provided free for desktop computers, i.e., may be down loaded from the Internet, so that as many desktop computers as possible may have the slave operating means available.

The slave operating means may be simple communication protocol software which the small computer can access when it wishes to access the large user interface. Preferably, if further software is required for operation of the large user interface from the small computer, this can be uploaded from the small computer e.g., in the form of JAVA™ APPLETS™. The slave operating software may merely need to be sufficient to receive the instructions from a small computing device and enable the uploading of the appropriate software for full control of the large user interface. The slave software may be available over the Internet, for example, via a Web page, or could be emailed directly to the desktop PC from the small computer.

The small computer user will therefore be able to carry their computer with them anywhere, perhaps manipulate the applications of the computer via the small user interface when there is no large user interface present, but connect to any large computer including the generic

slave operating software, to have the full advantage of a large user interface.

The large user interface need not be associated with a device such as a desktop computer. It could merely be a separate large keyboard and display. Other alternatives are that it could be a "dumb" terminal such as used in some systems, e.g., associated with a UNIX system. The dumb terminals have sufficient processing power to mount a slave operating means, such as discussed above. Alternatively the slave operating means could be mounted on the UNIX server.

The small computing device may connect to the large computing device via any conventional means, eg. by serial port, infra-red, etc. Such interfaces are already well known with such small computing devices as mobile phones.

In the present invention, application instructions are passed between the small computing device and the large computing device for access and control of the large user interface. The application software controlling the large user interface is resident on the small computing device and it is the small computers processor which is being used for processing. The large user interface may be controlled directly by instructions from the small computing device or via a software intermediary, such as a macro, for example.

The present invention further provides a computing system comprising a small computing device having any or all of the features discussed above, and a large computing device associated with the large user interface.

Preferably, the large computing device mounts slave operating means software which enables the operating means of the small computing device to access the large user interface of the large computing device.

Preferably, the computer system comprises a plurality of large computing devices, each large computing device mounting the slave operating means software, and a plurality of small computing devices as discussed above,

whereby any one of the small computing devices may access the large user interface of any one of the large computing devices.

The present invention further provides a method of adapting a large computing device comprising the step of loading the large computing device with a slave operating means which adapts the large computing device to enable a small computing device as discussed above to access the large user interface of the large computing device.

Preferably, the method of the present invention includes the step of loading a plurality of large computing devices with a generic slave operating means, such that a small computing device may access the large user interfaces of any one of the plurality of large computing devices.

The present invention further provides computer readable media storing instructions for controlling a large computing device to provide a slave operating means which enables a small computing device to access the large user interface of the large computing device.

The present invention yet further provides computer readable media storing instructions for controlling a small computing device to provide a operating means enabling the small computing device to access a large user interface of a large computing device.

The present invention further provides a method of controlling a computer system including a computing device, a small user interface and a large user interface, the method comprising the steps of operating the computer system so that commands received or output produced is adapted depending upon whether the large user interface or small user interface is being accessed, whereby different information may be output from or commands received for control of the same application running on the computing device.

The present invention further provides a computer system, comprising a large computing device and a large

user interface, and a small computing device, wherein the large computing device includes an operating means which enables a small computing device to control and/or receive commands from the large user interface.

In this aspect of the present invention, the small computing device may produce the same outputs and operate the same way on inputs from a large user interface or the small user interface. Preferably, however, as in accordance with the preceding embodiments of the invention, different outputs are produced and different input operation is provided depending upon whether large or small user interface is being accessed.

The present invention yet further provides a computer readable media storing instructions for controlling a small computing device to carry out a computing application, the instructions being adapted to result in the output of different information or be responsive to different commands received from an input interface, depending upon whether a large user interface or a small user interface is being accessed.

The computing application may be any software application, for example a word processing package, spread sheet package, etc.

The present invention yet further provides a method of preparing a software application for controlling a small computing device to carry out a computing application, comprising the steps of adapting the software application so that when it runs on the small computing device it is able to output different information or be responsive to different commands received from an input interface, depending upon whether a large user interface or small user interface is being accessed by the small computing device.

Software prepared in this way is therefore adapted to operate on a small computing device which can access large and small user interfaces, and is adapted to provide two modes of operation depending upon which interface is being

accessed.

The present invention yet further provides a small computing device, including a processing means and software applications, the small computing device being arranged to provide software instructions to a large computing device for controlling the large user interface of the large computing device so that the software applications of the small computing device may be accessed via the large user interface and may control output of the large user interface.

In the above aspects of the present invention, "large computing device", "small computing device" and "large user interface" have the same meaning as given above in relation to the first aspect of the present invention.

Features and advantages of the present invention will become apparent from the following description of an embodiment thereof, by way of example only, with reference to the accompanying drawings, in which;

Figure 1 is a schematic block diagram showing a computer system in accordance with an embodiment of the present invention;

Figure 2 is a schematic diagram showing a software architecture for components of the computer system of figure 1, and

Figures 3A and 3B are representations of displays of address information on, respectively, a large user interface display and a small user interface display, in a computer system in accordance with an embodiment of the present invention.

Referring to Figure 1, a computer system is illustrated which comprises a plurality of large computing devices 1, of which there may be many, and a small computing device 2. In this embodiment, the large computing device 1 is a desktop type computer, such as a PC. The PC 1 has a large user interface associated with it, in this embodiment including a CRT display 3, full-size

keyboard 4 and mouse 5.

The small computing device 2 may be a mobile phone having enhanced applications, such as address book, spreadsheet, word processing application, etc, and also a communication function as per conventional mobile phones. It may also have a limited user interface, in this example small limited operation keyboard 6 and small display 7.

The small computing device 2 also includes a communication means 3 which in this case is a serial port arranged to mate with a corresponding serial port in any of the PCs 1. An alternative communications means may be provided, such as infra red, for example.

Referring to Figure 2, each of the PCs 1 is provided with software in the form of slave operating system 1A. This software is arranged to enable the small computing device 2 having the software 2A, including a master operating system 10, to control the large user interface and receive commands from the large user interface of the PC 1. Applications 11 on the small computing device 2 can manipulate the display 3a and receive commands from the keyboard 4 and mouse 5 of the small computing device 2.

The slave operating system may be a simple communications protocol which enables a small computing device 2 to access the PC 1 and control the large user interface. If the small computing device 2 needs to load further software onto the PC for control of the large user interface, this further software could be loaded in the form of JAVA™ APPLETS™.

Because the slave operating system 1A is available on any number of PCs 1, this means that the small computing device can be completely portable while allowing access via large user interfaces. All the user has to do is connect the small computing device to the PC 1 via the communications port 3 and then all the applications from the small computing device can be accessed using the large user interface.

The master operating system 10 provides an alternative interface with the small device input means, so that it can output alternative displays to the small display of the small computing device, for example, and receive commands from the small keyboard.

The master operating system 10 is arranged to adapt to the commands received or adapt the output produced depending upon whether the large user interface or small user interface is being accessed. Different information may be output from the applications 11, therefore, or they may respond to different control commands, depending upon whether the large user interface or the small user interface is being accessed.

Figures 3A and 3B give an example of the different outputs that may be produced for a name and address application running on the small computing device 3. Figure 3A shows the CRT display of a large computer which is being controlled by the small computing device 3 via the master OS 10 and slave OS 1A. When the large display 3A is accessed, the entire name, phone number (both home and work) and entire address information are displayed. When the limited display 7 of the small computing device 3 is being accessed, however, only the name and a single telephone number are displayed.

Another example is that of a spread sheet application running on this small computing device 3. When the limited display 7 of the small computing device is being accessed, a single cell of the spread sheet may be displayed together with information such as the title of the spread sheet and other critical information required to make the display meaningful. When the large display is being accessed, however, the entire spread sheet may be displayed.

Similarly, the applications 11 may respond to different commands depending upon which user interface is being used. With the large user interface, commands may be input by way of a mouse and menu structure, but with the

small user interface scroll commands and a menu structure may be implemented.

This duality of operation of an application depending upon which type of user interface is being accessed provides many advantages and also makes the use of a small computing device as a persons "main" computing device practical.

The large user interface need not necessarily be associated with a large computing device such as a PC. The large user interface could even comprise a stand alone display and keyboard. It may also comprise a "dumb" terminal, as discussed in the preamble. It is preferred that the display be associated with a large computing device, however, as there are so many large computing devices already available. It is merely a matter of down loading (e.g., from the Internet) the slave operating system software and available large computing devices are immediately configured to operate with any small computing device in accordance with the present invention.

The applicants co-pending international patent application PCT/AU98/00173, the disclosure of which is incorporated herein by reference, discloses a "virtual machine" operating system for a communications device, such as an electronic funds transfer processor. This virtual machine operating system may be adapted to provide an operating system for a small computing device in accordance with the present invention. This virtual machine operating system has the advantage that it can be adapted for use with any hardware (e.g., any mobile phone). It also has the advantage that it can conveniently handle the transfer of instructions and data between the large user interface and the small computing device.

In this description, the preferred embodiment utilises a master operating system on a small computing device and a slave operating system on the large computing device. As discussed in the preamble, the necessary operating system

need not be an operating system as is known in the conventional terms, but the operating means could merely be a set of rules or protocol's which the software applications running on the small computing device need to obey. Similarly, the slave operating system need not be an operating system in the conventional manner, but merely may be a simple communications protocol which can enable a small computing device to upload instructions to the large computing device for control of the large user interface.

Where methods and apparatus of the present invention may be implemented by software applications, or partly implemented by software, then they may take the form of program code stored or available from computer readable media, such as CD-ROMS or any other machine readable media, the program code comprising instructions which, when loaded onto a machine such as a computer, the machine then becomes an apparatus for carrying out the invention. The computer readable media may include transmission media, such as cabling, fibre optics or any other form of transmission media.

It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.